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To The President U.S.

Letter from Prof. A. C. Bache
Answer to charges
preferred against him
by Prof. R. S. McCulloh.

1853.5

Philadelphia, January 17*th*, 1853.

SIR :—

When charges of a serious chaarcter, and from an apparently reliable source, are presented against a subordinate officer, it may become necessary for him to make a statement of the facts involved, to his official superiors, in order that they may judge how far such charges are sustained, and whether they should or should not withdraw their confidence and support from him. Such charges having been recently made against the undersigned by R. S. McCulloh, Professor in Princeton College, and my predecessor in office, I solicit your consideration to the following simple statement of facts, and cheerfully submit myself to your judgment upon the subject.

Mr. McCulloh having invented a process for refining gold, and having experimented to some extent upon it, while Melter and Refiner of the Mint, took out a *caveat* for the same within a few days after his accounts in the Mint had been closed.

When I entered upon the office, the influx of California gold began to swell the monthly deposites of the Mint, and finding from actual trial the inadequacy of the then arrangements for refining the increasing deposites, I was incessantly employed from month to month for more than a year in increasing the capacity and expediting the process of refining, in order that depositors might not be inconvenienced by having the payment of their deposites too long withheld.

Being by profession a chemist, and having been previously occupied in refining other metals, I was naturally led to devise other means of refining gold, if possible, more expeditious and advantageous than the method usually followed. I contrived one by the use of zinc, which I afterward discovered to have been the process patented by Mr. McCulloh, and finding the first stages of the process to work with remarkable facility, even on a large quantity of gold, I spoke in enthusiastic terms to him of the process. Upon continuing the operations through

subsequent stages, the extreme difficulty I experienced in obviating brittleness in the gold thus refined, induced me immediately to resort to another process, the main features of which were drawn from my experience in refining cobalt, in which I had been previously engaged. After making such experiments in a small way, as my means would permit, and with remarkable success, I took out a patent for the same in August, 1850, in conjunction with Prof. C. Morfit, of Baltimore, who had assisted me in the investigation.

Since neither the process of Mr. McCulloh nor our own had been tried on a working scale, the only true test of their value, both parties agreed to unite their interests to procure an appropriation from Congress for any new and better method of refining gold. That body having seen fit to appropriate $25,000 for such new process, as should, in your estimation, prove superior to the one now in use, I was instructed by the late Director, Dr. R. M. Patterson, to test the practicability of both the patented processes. I accordingly experimented on them at frequent intervals, with all the time, labor and knowledge I could command, so as not to interfere with the essential business of the Mint, during many months, reporting to the Director from time to time, the progress of the experiments. In February, 1851, I reported upon both processes, having overcome the brittleness of gold resulting from the use of zinc, and recommended the adoption of Mr. McCulloh's at the Philadelphia Mint, and of my own as the cheapest, most capable of variation according to means of refining, and therefore best adapted to the wants of California, if required there.

The experiments hitherto made having in view only the relative economy and convenience of the new processes compared to the old, and none having been instituted to determine relative wastage, the Director requested me to test this point, especially with Mr. McCulloh's process, which I had recommended. As I was an interested party, I requested the Director and his son, Mr. R. Patterson, to supervise the experiments, after I had given the requisite instructions to the workmen, who had previously conducted the process under my more immediate charge. The four experiments, which were tried,

proved unsatisfactory, generally exhibiting an unusual loss. The metal having been toughened by melting it in a reverberatory furnace, where the current of air might have caused loss by volatilization, in a fifth experiment, it was melted in a covered black lead crucible, but the same disproportionate waste was observed. Since the wastage, therefore, appeared greater by Mr. McCulloh's, than by the usual process, from volatilization of gold with zinc, or from some other cause, the Director, after reporting the experiment to the Treasury Department, disapproved of the introduction of the new method into the Mint.

Mr. McCulloh, disbelieving all representations made to him that I had experimented upon his process, and being fully convinced of its value, intimated to me through his father that he wished to separate our joint interests in the two patents. Knowing his to be defective and mine to be really a good process, I acceded to his request. Immediately after this, in the spring of 1851, he issued a pamphlet of 80 pages, embracing all our correspondence since we had thought of uniting our patented interests. As my letters were written hurriedly, in the midst of the pressing duties of my office, and to Mr. Mc Culloh, as a friend, in which light I had always regarded him, I confess that I felt not a little grieved that he should have deemed it proper to publish private and friendly letters, written at a time when, in the midst of onerous duties, I was robbing myself of the little leisure that remained to me, in the vain endeavor to make his process available by the Mint.

In August, 1851, he embraced, in a letter to yourself, severe charges against me, but I cannot imagine to this day how he could have allowed suspicion to fester in his mind, and result in such charges, because they are either entirely groundless, or arise from false inferences and unjust suspicion, although they sometimes appear to be actual misstatements. Dr. Eckert having been about the same time appointed Director of the Mint, the charges were forwarded to him by the Department for investigation. He entered at once upon this duty, and made the fullest inquiries of those who had witnessed or had personal knowledge of the steps taken by me in testing Mr.

McCulloh's process. The result of that investigation has been laid before you, wherein he not only exculpates me entirely from the charges, but speaks in such commendatory terms of the manner in which my official duties are performed, that I would not allude to the fact, except as a part of this narrative. The exculpation is the stronger, because Dr. Eckert had no personal acquaintance with me prior to his appointment to the Mint, and could therefore have had no prejudices in my favor. On the other hand, if it were possible to poison his mind with unjust suspicions, I may believe that Mr. McCulloh did not fail to make the attempt in the interviews which he sought with Dr. Eckert both before and after his induction into office.

In the fall of 1851, Mr. McCulloh obtained permission from the Department to try his process under his own supervision, a proceeding which I had urged upon Dr. Eckert immediately after his entering upon his official duties. The construction of furnaces and other arrangements were made during the whole of January, the experiments were tried by Mr. McCulloh in February, and the complete returns from the whole series of operations, upon about $250,000 of gold, were made by the 1st of April. The results of these experiments, made entirely under his own direction, and with all the appliances of the Mint, showing a greater wastage than the older process, even according to his own representation, the Director reported the same to the Department, and could not therefore recommend the adoption of Mr. McCulloh's process as superior or equal to the one at present employed.

Having thus presented a concise, historical sketch of the facts involved, I now propose to examine some of the charges which Mr. McCulloh has dragged out of those facts.

I would first however, observe, that while the utmost circumspection should be used in making statements, which may seriously affect the interests of others, either for good or for evil, it demands deeper consideration, when charges of unskilfulness or wastefulness are urged against an officer, whose duties demand the exercise of an unusual degree of skill and care. How much more grave it becomes when such charges are designed to affect

his moral character, the richest treasure of every man, and an essential requisite for the position I occupy. Does the individual making such charges aim solely at truth? Then every statement should be deliberately weighed, and its exact truth and bearing thoroughly ascertained, or else he who charges has recklessly robbed another of his treasure, and of that reputation on which his success in life depends. The simple desire for truth demands that the statements of others should be cautiously sifted and examined, lest he who charges be accused of a reckless disregard of truth and reputation, by giving opinions for facts. Truth requires that nothing more than the facts be given, to avoid prejudicing the reader's mind with matters unconnected with the subject. Nor should less than a full statement of facts be presented, because a sound judgment cannot be passed upon a partial view of facts, and erroneous inferences may be drawn from them. Besides, where more or less than the exact truth is given, the person making charges may be justly suspected of desiring to produce a particular impression rather than searching after truth. It is hardly necessary to say that facts should not be wilfully misstated, for it implies too great a disregard of moral principle. If the individual making charges against another's moral character, do not carefully sift every fact and weigh every word, so as to be safely within the preceding postulates, the danger is that the charges will recoil with dishonor upon his own head. If the charges are urged upon mere suspicion, such an attempt to blight the fair reputation of another is at least a harsh transgression of the common law of charity; while the nobler law of Christian charity demands an earnest endeavor, if possible, to attribute good motives to actions. Where, however, more or less than the truth is given, where the statements of others are incautiously received and urged as truths, where the facts given have not been cautiously examined, where facts and opinions are arranged to produce a prejudicing effect, where mere suspicion of motives is made the groundwork of inference and action, and where matters wholly foreign to the question at issue, such as charges against others than the one aimed at, are introduced—in such a case, we may well question, not merely the charitable

feelings, but the moral views and motives of the individual who makes such charges.

At the same time, it is perhaps prudent for the reader of charges to know some other circumstances connected with the individual making charges against another, to ascertain if possible, whether he could have any other motives than those he alleges for bringing forward such charges. If they are made against a public officer, do they spring from a sincere desire for the public welfare? Can no private motives have possibly had their influence? The violence of a charge, if not most surely ascertained and well founded, leads those, who know human nature, at once to the conviction, that not the public weal, but some real or fancied private grievance has impelled the author of the charges. In the present instance, it cannot be kept out of view, that an appropriation of $25,000 lay in the public treasury, for a method of refining gold better than the one now followed; and that Mr. McCulloh believed or affected to believe that he had invented such a method; that I, as an officer appointed to try this method, although interested to one-half in the process, could not bring it to a successful issue; that two Directors of the Mint, although fully desirous of employing a better method, if one could be found, were also obliged to pronounce against it; that Mr. McCulloh, after trying his own process himself, failed signally to prove its equality with the present method; that Mr. McCulloh had therefore failed to obtain $25,000, which he thought within his grasp, by the failure of his process in his own hands, as well as in that of others; and that therefore, after speaking in such unqualified terms of praise of his process, he should feel deep mortification and wounded pride, and seek for some object whereon to vent his feelings.

Mr. McCulloh's charges against me are embraced under several heads,—that I did not try his process fairly; that I was disingenuous when we divided interests in our respective patents, knowing mine to be worthless and his own to be good; that as an officer in the Mint, I am unskilful, wasteful, habitually regardless of the public good, and more devoted to my private interests; and beyond me, as the fittest target, he hurls his arrows

against two successive Directors of the Mint, and against other officers and individuals, whom he supposed to have been in a remote degree connected with the trial of his process.

I. Mr. McCulloh alleges that I did not try his process fairly, but "with ill-devised modifications of his process, and not according to the manner requested by him, and specified in his patent, and that I destroyed a furnace then existing in the Mint suitable for his purpose."

To this I reply,—1. That the present Director, immediately after entering upon the duties of his office, before he was personally well acquainted with me or my operations in the Mint, but better acquainted with the views of Mr. McCulloh, who sought interviews with him beforehand,—made full enquiries of officers who had witnessed my operations, and examined the men who had experimented on his process, agreeably to my directions; and the testimony, as the Director observed, "showed that the experiments were made with every care, that they were directed by me, the then Director personally supervising the operations, and that the Director and myself seemed anxious that the experiments should succeed;" that "the impression left on the minds of these witnesses was, that nothing requisite to the success of the experiments was left undone." The Director further expressed "his conviction that the proceedings of the late Director, and of the melter and refiner relative thereto, were influenced by a sincere desire to test its merits, and that every facility, towards ensuring its success, appears to have been afforded." This surely ought to carry conviction to the mind of even Mr. McCulloh himself, that every thing was done that could have been done. And in proof that such conviction was forced on his mind, I may state that after Mr. McCulloh had been in the Mint a short time to try his process himself, in Jan. 1852, and had conversed withthe foremen, he expressed himself satisfied that more had been done to try his process, than he had been made aware of, and that he had been misinformed by others. Now as his charges against me had been made in August, 1851, his acknowledgment shows that he had not been careful to make them from certain knowledge, but either from false report by others, or from mere suspicion.

In either case he holds the reputation of another too lightly to suppose that a generous solicitude for the public welfare was his impulse. There is only one other view of the case, that he preferred dissembling his feelings, while engaged in using the Mint appliances in trying his experiments, but I am unwilling to believe him capable of such duplicity, because it further involves an untruth. Moreover, in my letter to him of Jan. 23d, 1851, I urged him to come to the Mint to satisfy himself by personal inspection, because I had no leisure for lengthened correspondence ; which he refused to do, under plea of delicacy of feeling, although he was several times in Philadelphia. What delicacy of feeling could prevent a man from attending to his interest when respectfully invited so to do ?

2. The ill-devised modifications which he accuses me of using, were such as he had himself suggested to me, nor did he ever suggest any method, which I did not try ; nor did the caveat which he exhibited to me in 1850 say anything on the subject, as far as I recollect, except that it alluded to well known methods. That he afterwards devised a better method of granulating the metal is true, and no one can be more ready than myself to acknowledge the value of an improvement. That this method was an afterthought, he acknowledged in the presence of the present Director and myself. But if he designs to affirm that he had contrived such method originally, then why did he not communicate it to me, when he knew I was engaged in trying his process, while he himself was urging me to go on experimenting and directing me how to proceed, as he did in a letter to me ? (No. 24, page 25 of his large Memorial.) In such case, he either did not wish me to succeed, or he wished to gain experience at my expense and that of the government, in carrying out his process. I prefer the more charitable view, that he subsequently conceived of the method, after learning from my experiments the liability of his process to unusual wastage.

3. Frequent reference is made in his correspondence to my culpable delay in testing the process, and as a part of the same charge, he blames me for tearing down a test furnace in the cellar, where his process might have been tested in a short time.

In regard to that furnace, the space was needed for working the rapidly increasing deposites of gold, and I would not allow our private interests to interfere with the important interests of the government and the depositors of gold, as stated to him in my letters of November 25, 1850, and January 4 and 14, 1851. He has asserted in his letter of January 10, 1851, (Memorial, appendix p. 45) that his process "could be shown in forty-eight hours to be all that is needed." But yet in trying it himself in 1852, with all the conveniences of the Mint, and after gaining my experience, he occupied one month in preparing for the trial by building furnaces and making other arrangements, and nearly two whole months in carrying it out to completion. His two days expanded into two months, and yet after all, the Director was compelled to declare his process inferior to the present one. From the moment I entered the Mint (December, 1849,) until January, 1852, there never had occurred a period when there was less work than during January and February, 1852, when he was trying his process, and never up to the fall of 1851, had our facilities for refining been fully equal to the demand, without loss of time in paying depositors immediately after the value of deposites had been ascertained. Now had I abstracted three weeks instead of two or three months for testing the processes in 1850, when our most strenuous exertions could scarcely keep pace with the deposites of gold, a violent clamor would have been justly raised against us by depositors, and we would have incurred the just censure of the government and the public.

4. It appears from Mr. McCulloh's letter to the Director, September 29, 1851, (letter to Secry. Treas., p. 19,) that *after* making the charges against me of unfairness towards him, &c., in his letter to yourself, he had obtained a copy of my report to the then Director, (February, 1851,) *recommending his process*, which report he has published in his report to the Secretary of the Treasury, (p. 43.) In other words, after charging me with unfairness, he finds I had been so fair at least towards him as to recommend his process in preference to my own. Surely, if the natural desire of reputation involved in my own invention, be duly compared with my expressing a public preference for

his, this, together with my repeated and earnest endeavors to make his process work successfully, will outweigh every imputation of unfairness. After making the above charges, he discovered that, so far from being unfair to him, and that I "would certainly adopt my own process, if I could make it work," (Letter to Secry. of Treas., Feb. 28, 1851,) he has found by documents that I had worked at his process again and again, in the endeavor to make it successful, while but little time had been devoted to my own.

5. Mr. McCulloh endeavors to exhibit me as trying his method either unfairly or unskilfully, by quoting the experiments of Mr. Bonzano, of the New Orleans Mint, to whom he had written requesting him to try his process; saying that "that *disinterested* [the words are italicised by Mr. McCulloh himself,] melter and refiner, had found no great difficulty in promptly proving the practicability of the plan." Entertaining a high opinion of Mr. Bonzano, I wrote to him on the subject, and in his reply he says that he "made several unsuccessful experiments with the McCulloh's process." He then toughened four lots in sand crucibles, which I had already done in November, 1850. Upon Mr. McCulloh's request to try it on a large scale, he did so, and wrote to me of this experiment, that he "failed in every attempt to toughen the gold," and that he "was nearly discouraged." These difficulties experienced by so able an officer as Mr. Bonzano, might at least be urged as a palliation of my long continued want of success, and shows that he did find great difficulties in carrying out the process, which he has the ingenuousness to acknowledge. Mr. McCulloh informed the Secretary of the Treasury that Mr. Bonzano found no great difficulty, and Mr. Bonzano said himself that he did ;—which is right? Mr. Bonzano finally succeeded in toughening the gold, and so did I, although in a different manner. But when asked whether he had tried how much *wastage* the gold had suffered in refining, he replied that he had not tested the process with that object in view, and could not say how much it was. Now it was because of a larger amount of wastage than usual that the late and present directors have both been obliged to condemn Mr. McCulloh's process. It is, therefore, clear that he cannot show,

through Mr. Bonzano, either my unfairness or unskilfulness, and that, in attempting to do so, he has misrepresented Mr. Bonzano.

It appears, then, that I performed experiments on Mr. McCulloh's process by methods suggested by himself, either verbally or by letter, as well as by methods of my own—that while I tried them faithfully and without success for some time, although subject to much interference by paramount duties, yet that he was engaged in the same for three months without interference, and yet unsuccessfully—that Mr. Bonzano, of the New Orleans Branch Mint, after repeated failure, had succeeded in toughening gold refined by zinc, but had not tried for wastage, which was the sole point on which that process was condemned —that I reported in favor of Mr. McCulloh's invention in preference to my own, before the question of wastage had been broached—and that the present director, after a bare introduction to me, thoroughly investigated the charges of Mr. McCulloh, and was convinced that every thing had been fairly tried to render the process successful. How can Mr. McCulloh, in the face of all this, which is known to him, assert that the slightest unfairness was felt or exhibited towards him ?

II. Mr. McCulloh charges that I sought to acquire and did acquire an interest in a valuable grant (his patent,) by assigning him an interest in my alleged invention, while knowing it to be destitute of efficacy and value; "a transaction," he says "to which I shall not apply the term that would most aptly designate it." That I "manifested want of integrity in failing to demonstrate *my alleged invention* to be such as I had professed it to be, when I was bargaining for an interest in his." He further says that I cannot "escape from the discredit which my acts in this matter have fastened upon me, or recover, in the esteem of honorable men, from the position in which these acts have placed me." These, sir, are severe expressions, but not too severe for the motives imputed to me, if they were true. But before using them, the author should have used extreme care to know whether the facts were such as he represents, whether there could not possibly have been other motives, and above all, he should be extremely careful not to

misrepresent facts in the slightest degree. He deals fire and death, who wantonly assails reputation, without certain knowledge, and on mere suspicion.

1. Assuming for the moment that I was bargaining for an interest in his patent, I will first examine how far we were then acquainted with the true practical value of each process. Mr. McCulloh, in a letter to me of July 16, 1850, (large memorial, Appendix p. 10,) says that he succeeded perfectly "upon a small scale," and was "confident" that he would "do the same with entire ease upon any scale," although he did not possess the facilities to make a trial. At that time, then, he had not tried his process on a true working scale, but he *believed* it would be successful. In another letter to me, August 14, 1850, he says "The difficulty of brittleness (in gold refined by zinc,) may readily be overcome, if my experiments on a small scale can be relied upon." It is clear that he had not up to the middle of August, 1850, tried his process on a working scale, but believed it would be a good one, if his small experiments were to be relied on. In other words, some doubts of the value of his process then lingered in his mind. I had just then evolved my own process with Mr. Morfit, but only on a small scale, and as it worked perfectly, we were as sanguine that it would work on a large scale, as Mr. McCulloh was of his, although Mr. Morfit and myself were too well aware of the difference between small experiments and manufacturing processes, to declare that we were absolutely certain that our process would be equally successful when applied to the huge operations of the mint.

It is a universally received opinion among manufacturers, and the result of long and sad experience, that until newly devised processes are carried out on a working scale, no positive opinion on their success and adaptation to the object in view can be formed. It appears from written documents, and it was often remarked by each party in relation to our processes, when we united our interests, that we had full confidence in their successful execution on a large scale. But this confidence was a belief, based upon small operations, not the absolute confidence resulting from an actual manufacturing trial, but a confidence

notoriously characteristic of inventors, and which all capitalists who have tried new machines and processes thoroughly understand, often through severe loss. Mr. McCulloh did not know the manufacturing value of his process by the middle of August; he left Princeton for Washington the latter part of August; we agreed to unite our interests early in September, and that union was consummated on the 12th of September. There was not sufficient time for him to try his process practically for rapidity, economy and wastage between the time, when he acknowledged he had not tried it and knew not how it would work on a large scale, and the time when we united our patented interests. At the time, therefore, of our union, we were both on the same footing, each sanguine of the successful issue of his invention, and neither dreaming that his could prove to be a mere "alleged invention, destitute of efficiency and value." While I "was bargaining for an interest in his," Mr. McCulloh did not *know* how his process would work on a large scale, and yet he accuses me of want of integrity in obtaining one-half interest in his invention, while I knew mine to be valueless. Since he did not know its value then, and as it has since proved valueless, even in his own hands, I might with equal justice accuse him of want of integrity in bargaining for an interest in my invention when he certainly did not know the true worth of his own, but I would be ashamed to throw such aspersions upon another's character, least of all upon one whom I had ever esteemed.

2. Mr. McCulloh has stated in a letter to the Secretary of the Treasury of January 23, 1851, (large memorial, p. 55,) that our "union was based upon my averments, that my process of refining was more efficient and economical than any other known method." That it was more economical and very efficient, I certainly believed and stated, precisely as Mr. McCulloh believed and had stated in his memorial to Congress, of July 5th, in relation to his own method, but both of us believed the same from our experiments on a small scale. Moreover, if he believed my statement that mine really was more efficient and economical, even than his own, then he must have believed that his process was inefficient and valueless

compared with mine, and he was clearly "bargaining for an interest in mine, knowing his own to be destitute of value. If he did not believe mine to be better than his, why did he wish, and why was he anxious to unite with me? He is welcome to either view of the subject.

3. But the facts of the case are very different from what he states or leads others to infer. So far from bargaining for an interest in his invention, I yielded to his solicitations to unite with him, against the wish of Mr. C. Morfit, a party interested in my patent, and against the urgent desire of his father, H. M. Morfit, Esq. Mr. C. Morfit had experimented on our process, and knew it to be good and perfect on a small scale, while he doubted the value of Mr. McCulloh's process. I informed the latter in a letter August 13, (large memorial, Appendix p. 13,) that Mr. Morfit and myself had been working out another process, in reply to which he says (letter, August 14th,) "If Morfit and yourself have fallen on a method entirely different from either of mine, (Mr. McCulloh had another process besides that with zinc,) might it not be well for us to perfect and unite the whole. Should either of them be used in preference, as the most perfect, the others have still value protectively." This first suggestion of union of interests came from Mr. McCulloh himself, and not only so, but he evidently did not know which process would be preferred, and proposed uniting, even if any two of the processes should fail. He therefore bargained for an interest in mine, fearing lest mine should be preferred.

I yielded to his solicitations to unite with him, although believing mine to be the better process, because he had occupied the field before me—because he had already expended time and means on his patent—because we could not know which would be successful on a manufacturing scale—and especially because I harbored the kindest feelings towards Mr. McC., and believed I was benefitting him by the union. From this view of the case, it could not but surprise and grieve me, that he should torture my good intentions into a want of integrity, and that he should allow such a suspicion to sway his actions, as to induce him to exert himself in giving publicity to a groundless charge against me. But when this charge

is based upon an untrue statement, (for he was the first to bargain, not I,) my surprise is changed to regret that any motive could have such power over him as to lead him to make a misrepresentation. Surely the desire of truth cannot lead to untruth, but some other motive, and a powerful one, must have been the impelling power.

4. He adduces as a sort of proof that I knew my process valueless, that, upon his demanding a mutual release of interests in our patents, I yielded it upon such demand. Why should I do otherwise when I had tried his process and found it valueless, while my own proved superior to his?

5. A word more in relation to my process. Mr. McC. says that I admitted, and that the late Director reported the results of my experiments with my process to be such as demonstrated my invention to be destitute of efficiency, and therefore of no value. (Pp. 9, 10, Letter to Sec'y Treas'y.) But as he has published, in his Report to the Secretary, (Report, p. 43,) my Report on both processes, made February 6, 1851, to the Director, I assume that he must have read the latter. After speaking of the advantages of my process, I say, "Since, however, its use would not be a gain of the time required for refining, over the present process, and its introduction would require a total change of apparatus and arrangements in order to carry it out most successfully, attended with loss of time in making such change, I do not recommend its adoption in the Philadelphia Mint." I then recommended it as the best process for California, on account of peculiar advantages it presents in economy of material, &c. Does this demonstrate its want of efficiency? It only demonstrates that I held my public duties superior to my private interests, and nothing more can be tortured out of it by any one desirous of knowing and giving the simple truth. At the time of making this Report, the accumulating deposites of California gold urged the energies of every officer, and stretched the working capacity of the Mint to the utmost. To have recommended a change of apparatus then, would have been almost madness on the part of one of the officers.

To show the value of my process by facts, I here present

the results of an experiment made with it in October 1852, at the request of the Director, to ascertain the adaption of different processes for California.

	Ounces.	Fineness.	Pure Gold.
Deposit No. 8227,	1209.29	883.3	1068.166
" " 8178,	853.62	901.5	769.539
		Delivered,	1837,705
Returned Bar,	1422.57	991.5	1410.478
Residue grains and sweep,			424.801
			1835.279
Loss, (1.32 thousandths.)			2.426

The loss in this experiment is within the legal wastage, but still far above wastage by the usual process. It should be observed, however, that no special pains or arrangements were adopted for trying it, excepting a wooden tub, and covers for the porcelain pots. As these covers were lined with sheet-zinc, it was afterwards found that so much zinc had entered the gold, as to account for the wastage in melting. But even with this wastage, the cost of refining is reduced to so low a rate, the chemical materials costing only $1\frac{1}{4}$ cents per ounce refined, that the expense of wastage and material taken together, is about the same, or rather less than the wastage and material together of the process we usually employ. Therefore, although the experiment was attended by an accident causing unusual wastage, yet it compared favorably with the best process.

In another respect, my process is superior to any other known, because the smallest amount of oil of vitriol is required for it. In my process, oil of vitriol is used to develope nitric and muriatic acid for dissolving gold; in the present mint process, it is used for preparing nitric acid to dissolve silver; and in Mr. M'Culloh's, it is directly used to dissolve zinc. Reducing the whole to oil of vitriol, in order to compare them together, the following are the quantities required by each process for the same quantity of gold:—

Gold.	Oil of Vitriol.	Process
For 200lb.	300lb.	My own.
" 200	450	Mint.
" 200	900	M'Culloh's.

If, therefore, acid is to be transported to California, the mint process requires 50 per cent. more acid to be shipped than mine, and Mr. M'Culloh's 200 per cent. more. Even if acid is to be made in California, mine presents the same proportionate advantages, because of the greater cost of labor in that country. Surely, then, my process is not only not inferior in economy to the best, but it presents peculiar advantages, which must give it a claim above all others for refining gold in California.

III. Mr. M'Culloh has repeatedly asserted in his pamphlets, that I am habitually regardless of the public good, and more devoted to my private interests, spending the greater part of my time in a private laboratory, and being engaged in manufacturing cobalt.

1. If neglect of the business of my office, in the mint, be designed by the assertion, it may easily be shown to be untrue by the resulting workings of the refining and melting operations under my charge.

There were refined

By Mr. M'Culloh from Jan. 1, to Oct. 31, 1849,	$4,042,000
By myself from Nov. 1, 1849, to Dec. 31, 1850,	34,345,000
By myself from Jan. 1, 1851, to June 30, 1851,	20,406,000
" " Aug. 1, 1851, to July 31, 1852.	51,424,000

These amounts are far greater than have ever been refined in any establishment, it is verily believed, in the whole history of gold refining in the world, and in the last year, probably five times as great. It is scarcely possible to suppose that a neglect of duty has been the means of expanding the refining of our gold five times beyond what the world has witnessed.

2. But further, Mr. M'Culloh was aided in the performance of his duties by a young gentleman of signal ability, Mr. J. B. Reynolds, whose untimely decease we have since had cause to lament. Upon entering my official duties, I was solicitous also to retain his services on the same footing, while Mr. M'Culloh

urged me to desire his appointment as a regular assistant. The Director, Dr. Patterson, objected to the creation of a new office by the retiring melter and refiner, properly prefering that I should determine, after becoming acquainted with the duties of my office, the necessity of having an assistant. Under the advice of Mr. M'Culloh, Mr. Reynolds declined any position less than that of assistant, and I was therefore obliged to perform entirely alone, all the duties of my office, although the deposits of California gold were more than double the largest amount received by Mr. M'Culloh. This surely does not savor of neglect in the performance of my duties at the mint. At that period, in fact, I frequently spent days together at the mint, from 6 or 7 A. M., until 10 or 12 P. M. Then, however, the duties became so onerous as to demand some relief, and I accordingly asked and obtained permission to employ Mr. J. H. Taylor, to aid me in my office duties. I did not ask for an assistant, although authorized to do so by the mint law.

3. If by neglect is meant merely devotion to other pursuits, I will acknowledge I have been engaged in them. I have found time to act as a Trustee, Manager, &c., in various scientific, literary, and useful institutions, and even for writing and publishing what I believe to be useful works, none of which have ever remunerated me for a tenth part of the time spent in or upon them. I do not, however, suppose Mr. M'Culloh meant such engagements by his assertion, for if he had acted on the principle of exclusive devotion to his duties at the mint, the world would have been deprived of the result of his valuable researches on Hydrometers, with their calculated tables, and of his valuable and voluminous reports on Sugars.

4. Before he charged me with spending my time in refining cobalt instead of refining gold at the mint, and thus attempting or designing to throw odium upon my official course, he ought to have been very sure that I was really and actively engaged in the same. If I had had capital invested in it, upon entering the mint, and then gave no time to it, this could no more be a ground of complaint than if I owned property, and went several times in the year to collect the rent. There could be no

more harm simply in being interested in such manufacturing property, than in Mr. M'Culloh's ordering a large lot of glass hydrometers from Germany, through me, for private sale, after he had recommended the use of such hydrometers to the Government, in his Report on the subject. I am far from finding fault with him for such a course, that he would derive emolument from it in addition to his salary in the mint, because I know it would not interfere with his official duties. But the truth is, I left all active participation in the cobalt works, full eighteen months before I entered the mint. That I have since felt an interest in those works, was natural enough, because I first commenced them, and because they were the first works of the kind in the United States, and I felt a degree of pride in opening a new source of national wealth. I am not at all interested pecuniarily in those works, and since I have been in the mint, (during three years,) I have visited them not more than six or seven times, at the farthest, and then not more than an hour at a time, and then always in the afternoon after mint hours. Mr. McC's endeavor to depreciate my services at the mint should have been more carefully based than upon mere conjecture or vague information.

5. His only remaining ground for a charge of neglecting official duties is that I have a private laboratory in which I receive business. I have such a laboratory, and if I regarded my pecuniary interest alone, I would at once abandon it, because it has already, in the three years of my connection with the Mint, cost me above $1000.

Any one acquainted with chemistry knows full well, that a practical chemist cannot even retain the position and reputation already gained, much less keep pace with the advancement of the science, without a laboratory in which he frequently experiments. A laboratory to the chemist is what his library is to the lawyer, and experiment his most important volume of reference. Mr. McCulloh himself acknowledged its importance, for he states (Report p. 8) as a reason for his absence from the mint, during his own trial of his process, that he was "attending to analyses of the materials employed by him, which he made in the laboratory of his friend Dr. C. Wetherill." Moreover, while

he was melter and refiner at the mint, he obtained the consent of the then Director to purchase apparatus and materials for a laboratory, which he found necessary. It is inconceivable why he should suppose a laboratory necessary for himself and not for me, unless some singular motive, other than the public good, may have moved him. Before entering upon my duties, as his successor, I engaged an assistant, to take entire charge of my private laboratory, where there was every convenience for experimenting. As soon as I found that the influx of California gold demanded all the space in the mint, and no room was left in it for chemical experiment, I determined to retain my private laboratory, as subservient to my position as melter and refiner; but as the cost of maintaining it would have absorbed the greater part of my salary, I designed, and have endeavoured, to retain only such an amount of business, executed by my assistant alone, and not myself, as would pay the cost of its maintenance. I have, however, been so rigid in this respect, that its actual cost to me has considerably exceeded $1000. I have made it subservient to my office; for not only have I used it for experiment to retain and advance my general chemical knowledge, which I am bound to do from the nature of my office, as melter and refiner, but I have frequently employed it for mint purposes, for analysis of sweep, slag, metal, crucible, &c. &c., as well as for investigations to ascertain where and what improvements could be made in the operations of refining gold and silver. That I have been in general successful in these researches, the results of my operations as melter and refiner abundantly testify, not so much in the enormous amounts of gold refined, as in the saving of tens of thousands of dollars to the Government, as will be subsequently shown.

It would appear then, that so far from neglecting public duties for my private affairs, I have elevated the refining capacity of the the mint manifold beyond that of any other establishment in the world,—that I did this with less assistance than Mr. McC. enjoyed,—and that I have made my private laboratory, sustained at my own cost, subservient to the interests of the mint, and by the saving introduced, have rendered it greatly advantageous to the government and the public.

IV. In numerous passages in his pamphlets, Mr. McCulloh endeavours to throw discredit on my operations as melter and refiner of the mint, by asserting my want of skilfulness and care in conducting them; and although he puts prominently forward the injury entailed upon the goverment and depositors of gold, yet a minuter inspection and comparison of such charges, whether direct or inferential, naturally leads one to perceive that he imputes his loss of the $25,000, appropriated by Congress, to my carelessness and unskilfulness. If he has thus suffered through me, there might be sufficient reason for such charges, provided he make a fair and exact representation of facts, which an analysis of them will determine.

1. Mr. McCulloh dissuaded me from seeking the position of melter and refiner, after his resignation, but finding at length that I had resolved to apply for the same, and knowing that my recommendations of qualification were of the strongest character, from many individuals of all parties, he himself wrote a letter of recommendation to his father, in Washington, from which the latter inferred and urged my *extraordinary fitness* for the office. He subsequently acknowledged me to have sufficient skill to appreciate and retain the apparatus for parting, he introduced into the mint, in preference to the former system. Again, he acknowledged that I improved that arrangement. After conceding so much, when he found it suitable to his purpose to disparage my operations, he averred that I merely extended his arrangements to work a larger quantity of gold, without introducing any improvements. Since he has claimed much credit for these improvements, while throwing some blame upon other officers of the mint for not immediately consenting to this introduction, it may not be amiss to examine what those improvements are. In parting or refining by nitric acid, it was usual to melt 1 lb of gold with 3 lbs silver, to put several lbs of this mixed metal into a glass flask, pour upon it pure nitric acid, and heat the flask on a sand-bath in order to extract the silver. Mr. McCulloh, used 1lb of gold to $2\frac{1}{2}$ lbs silver, thereby diminishing the cost of acid $\frac{1}{6}$, and introduced the metal and acid into stone-ware and porcelain jars,

which were heated by steam, in a water-bath. This is the whole substance of his improvements, which I was, however, so far from depreciating, that I retained, enlarged, and improved them. As to their novelty, this arrangement is one of the most common in other chemical manufactures, which was the source whence he derived them. I had used almost precisely the same arrangement in refining cobalt and nickel, for two years before he applied it to gold, and in conversation with him at the cobalt works in 1849, I urged him to use steam heat in the mint. Being therefore well acquainted with such arrangements from long practice, I was not willing to abandon them, when I became his successor in the mint, until they had been fully tried. I tried them, enlarged and improved them, as I will presently show from the results. But that the other officers would have hesitated to introduce a new and untried method in place of one well known and approved of, when the influx of California gold was constantly on the increase, and when the older method was capable of doing all the work up to that time, and could have easily been extended to do more, displays in strong colours their prudence and desire of the public welfare.

2. He has stated that by the older method the refining capacity of the mint was $100,000, per month. There are documents in the mint, prepared by me in December, 1849, at the request of the Director, three weeks after I had entered upon my duties as melter and refiner, in which the comparative value of the older apparatus and Mr. McCulloh's were given from actual workings. By the old apparatus, which he tore down to introduce his own, 5 hands in 7 working hours per day could in one month (of only 20 working days) refine $330,000.* By more rapid work (at 20 instead of 30 minutes) they could have worked $500,000, per month. There was room to have trebled the then apparatus, so that there might have been refined $1,500,000 per month, with three times as many hands or less. It is not at all surprising that the officers objected to his new and untried arrangements, with such well-known data before them.

* The other elements of the calculation are, 4 flasks containing 5½ ℔ mixed metal, worked off every twenty to thirty minutes.

3. By introducing his new arrangements, Mr. McCulloh claims that he did not interrupt the refining operations, (Memorial, p. 4.) The following table will show how far they were interrupted:

DEPOSITES OF GOLD TO BE REFINED, RECEIVED IN 1849.

OLDER PROCESS.

January,	$34,000	Prompt payment.
February,	30,000	" "
March,	114,000	" "
April,	326,000	" "
May,	500,000	" "
June,	743,000	" "

INTRODUCING NEWER PROCESS.

July,	$326,000	Delay of 10 days.
August,	475,000	" 10 "
September,	701,000	" 12 "
October,	793,000	" 20 "

I commenced working the deposites of November in December, after his accounts had been closed. I do not blame him for these delays, because they are necessary accompaniments of alterations and new arrangements, but surely he cannot assert that he did not interrupt the refining operations.

4. To give the public an exalted idea of the extent of his improvements, Mr. McCulloh asserts that "the refining capacity of the Mint was thereby increased at once to $1,500,000 per month." (Memorial, p. 4.) Those documents prepared by me at the Director's request, in December, 1849, show, from the daily operations of Mr. McCulloh's own apparatus, precisely as he left it, that it would only refine $1,000,000, or more accurately $972,000 in 20 working days, estimated from 13 days of actual trial. The only way that I can account for his estimate of $1,500,000, is by supposing that he makes his actual working in October the basis of his calculation. But this is unfair, because he overworked the men, often keeping them on duty until ten, twelve, and one o'clock in the night, and

giving them so large an amount of double wages, that the Director objected to it on principle. To compare the improvements he made with the older process, they must be compared for equal times, because the latter could have been kept up all night, as well as his own. We have seen that the older process could in the usual working hours refine from $336,000 to $500,000 per month, and that his process, as he worked it, could refine about $1,000,000, or only double or treble the amount, instead of fifteen times the amount, as he claims. Lest I be misunderstood, I must repeat, that I am not attempting to depreciate his apparatus, because I had long before used it for refining other metals, and valued it; but when he endeavors to vaunt his improvements in order to contrast them with my insufficiency and inability, it is reasonable that I should inquire how far he is just in his assertions. I regret that the inquiry he has forced upon me, has resulted so unfavorably to his accuracy of statement.

Since Mr. McCulloh has endeavored to depreciate my services in the Mint, by asserting that he arranged his apparatus when he left so as to need only enlargement, and that I had merely done so, without improving it, I am unwillingly necessitated, in self-defence, to speak of my improvements, although I do not do so boastingly. Excepting the use of the porcelain and stoneware jars, and a steam heat in the parting process, there is scarcely any thing in the refining department remaining as he left it. Every thing else has since been arranged with a view to expedite the process, and to diminish the cost of material and amount of labor. Even in the melting department, the improvements he introduced were abandoned because they would not work well. One result of this has been, that whereas he employed fourteen hands to refine at the rate of $11,000,000 per annum, and could not do more except by night work, I have refined $51,500,000 in the last year with thirty-five hands; i. e., with two and one-half times as many hands, I have refined about four and three-fourths times as much gold. Beside this, we have had at times a good deal of leisure, and the same number of hands I now have (calculated as I have done the estimate of $11,000,000 for him,) in the same appa-

ratus which I now have, could readily refine $80,000,000 per annum. I need hardly go further to show that my alterations of his apparatus are not a mere enlargment.

6. I may, however, go a step further, and show numerically the value of some improvements made by me. Mr. McCulloh employed 2½ lbs. of silver to 1 lb. gold, for parting, and required 6.129 lbs. nitric acid to extract the silver, so as to bring the gold to 990 m. fine, as ascertained from thirteen working days of December, 1849, when 35,000 oz. ($630,000) were refined. I employ 2 lbs. of silver to 1 lb. gold, and only 5.068 lbs. of nitric acid for that amount, to bring the gold also to 990 m. fine, as ascertained from the working of 226,800 oz. (more than $4,000,000,) in October, 1852. If we now estimate the cost of nitric acid for refining the $51,000,000, which I did from June, 1851, to July, 1852, at the present rate of 7⅛ cts. per lb, (reduced from 8 cents within a year,) Mr. McCulloh's operations woul dhave cost $102,180, and mine $88,192, making a difference in favor of my improvements of about $14,000, actual saving. Add to this the larger amount of silver his mode of operating would have required, $375,000 instead of $300,000, the greater amount of fuel and labor to melt the metals, the larger amount of salt, zinc and oil of vitriol, in each case about twenty-five per cent. more than I employ, and the numerical value of my improvements over his amounts to at least $16,000 in one year.

In his letter to the Secretary of the Treasury, he states, (p. 8.) that he had employed with his apparatus 2 ℔ of silver to 1 ℔ of gold, and that he could only bring the gold to a fineness of 985, leaving 1½ per cent silver in it. I find but one record of his experiments, in a letter to the Director of Oct. 3, 1849, where he says he brought up the gold to the fineness of from 968 to 983. I however, do now, with the same proportion of metals, bring the gold to 990, saving a full ½ per cent. silver more than he did, and at less cost. Assuredly I may claim some improvement in the refining operations.

Further, comparing the cost of labor for refining his $11,000,000 with what it would have cost to refine $51,500,000, the amount is $33,000, while upon the same basis of calcula-

tion, (an average of $500 per man,) it has cost me $17,500, which is again a saving of $15,000, consequent upon my improvements. The two items of parting and labor amount to $30,000, which I have saved, as compared with Mr. McCulloh's refining.

7. One of the most striking evidences of the improvements (not mere enlargement,) I have introduced into the operations of my department, lies in the wastage exhibited upon the settlement of my accounts. I present the following table from the accounts of the Institution, comparing the three settlements of my accounts with that of Mr. McCulloh's last year, in which alone he worked California Gold, and which, therefore, can only be taken for the comparison.

By.	Date of Settlement.	Am't in Stand. Oz.	Waste, oz.	Ratio.
Mr. McC.	Nov. 30, 1849,	672,586,981,	238,823,	.00035
J. C. B.	Dec. 31, 1850,	3,084,378,210,	688,773,	.00022
"	June 30, 1851,	2,554,748,442,	635,167,	.00025
"	July 31, 1852,	5,073,576,770,	1,246,578,	.00025

In the first place, if we compare his ratio with my highest, we observe a diminution of wastage of .0001; and if this be calculated for the amount of gold charged to me from June, 1851, to July, 1852, equal to more than 5,000,000 oz. standard, his excess of wastage over mine is 507½ oz., or more than $9,000. In other words, I have at least saved 9,000 from actual wastage.

In the second place, the melters and refiners before me melted the deposites of gold themselves, and the grains derived therefrom diminished their apparent wastage, or marked its actual amount. But from the moment of my entering into the office, the melting of deposites was put under charge of the assay department, and only the sweep, and a portion of the grains were allowed for the benefit of my first wastage account. Yet my wastage was lower than Mr. McCulloh's by .00013. His ratio calculated to the same amount as charged to me, Dec. 31, 1850, would have occasioned a loss of 1079.532 oz., instead of the 688.773 oz. actually returned. My improvement that year, was therefore, above $7270. It will be observed that the ratio of my wastage, at the second and third settlements was .00025, a slight increase over my first, but the reason is, that I received no benefit from the grains of deposite-melting.

Mr. McCulloh has quoted the value of grains from deposite meltings, in his Report to Secretary of Treasury, (p. 15); and had I received the benefit of these grains during the last year, my wastage account would have been reduced almost to nothing. In other words, comparing my wastage with that of Mr. McCulloh's last year, I have saved an absolute waste or loss of gold during the last year of $30,000.

The means of diminishing the wastage are not accidental, but were adopted by me with this express object in view. This is assuredly not enlarging or extending his apparatus, but a positive improvement, having no reference or relation to his improved arrangements.

In view of the facts exhibited above, it is not surprising that Mr. McCulloh, when making inquiries on these matters during the progress of his experiments in the Mint in the beginning of 1852, should have been startled by the results, and should have devoted six pages of his Report to an investigation of wastage. I can readily imagine how much more he will be astonished, when he learns that, although I received no benefit whatever from the deposite grains at the two last settlements, my ratio of wastage should have been so much lower than his.

Now, by putting together all the items of saving, from labor, materials, and wastage, we find that during the past year I have expended $60,000 less than Mr. McCulloh would have done, compared with his own working and data. I wish to be distinctly understood, that in thus speaking, I do not design to express a vainglorious boast of my superiority, but simply to show, by numerical data, derived from actual observation, that his assertions relative to my inability and want of skill and care, are utterly without foundation.

8. One ground brought forward by Mr. McCulloh, as evidence of my incapacity, is the large amount of the bullion fund, designed to meet payments of deposites, immediately after the value of a deposite has been ascertained. That fund was $1,000,000 during his last year, and was quite sufficient to meet the payments, although the table given at p. 23 shows that payment was not punctual by from ten to twenty days, when the deposites to be refined averaged less than $600,000

per month. We now have a bullion fund of nearly $5,500,000, and the deposites are about $5,500,000 per month. But now, it is deemed advisable to retain nearly a million on hand in small gold coin to meet the wishes of the public, beside a large amount of silver for making three-cent pieces, so that our available fund is less than $4,000,000. Besides, we now pay depositors within one or four days of the time of making their deposites, a time barely sufficient to determine, by assay and calculation, the value of each deposite; and if we were to postpone payments for from ten to twenty-five days, as Mr. McCulloh caused in his last half year, we would not really require more than $2,000,000 as a bullion fund. For our actual refining, executed with facility, is $600,000 in ten days, $2,400,000 in seventeen days, and so on, adding $600,000 for every two days. If we were driven to work rapidly, by the magnitude and rapid succession of deposites, we could refine $800,000 or even a million in ten days, $2,500,000 in fourteen days, and $7,000,000 in a month.

Now as it would require only from four to six days to coin $2,500,000, it follows, that in twenty days we could pay the deposites of the largest arrivals of gold yet received, without any bullion fund at all. The object of the bullion fund then, is merely to accommodate depositors by paying them after they have deposited their gold, as soon as the value of their deposite is ascertained, without waiting for the refining of the same lot of gold which they have deposited. Mr. McCulloh, understood the whole of this subject perfectly, and should not therefore have allowed himself to make a charge of unskilfulness, when he well knew that such a charge could only be believed by those who are unacquainted with the operations of the Mint, and where he knew that a like energy had not been witnessed in the whole history of refining gold. If he did not know it, then he was very ignorant of his duties as melter and refiner in the Mint. In either case I regret that he should have exposed himself unnecessarily.

Mr. McColloh has charged in his letter to the Secretary of the Treasury, that a strong evidence of my unskilfulness lies in the fact that there was left at one time 5 per cent. silver in the gold, and for a long time 2 per cent, while he was allowed

to leave only 1 per cent in it; this was done by the officers of the Mint "to obviate the necessity of additional transfers of public money to the mint (to the bullion fund;) and to screen the inefficiency of the melting and refining department."

A sufficient answer to this, on my part, might be, that I was ordered to do so, and that, as Mr. McCulloh knows, the law of Congress of 1837, expressly allows the per centage of silver to reach 5 per cent, and further, that the charge of refining is fixed by the Director and the Secretary of the Treasury. I wish however, to say a little more on the subject.

The amount of 5 per cent silver was left in during a short period, simply because the influx of gold was too rapid for the then refining capacity of the Mint, and depositors and the public would have been clamorous at the delay in payment, if we waited to refine the gold to the full extent of which we were capable. Mr. McCulloh has ingeniously put together the whole amount of silver left in the gold coin from November, 14, 1850, to April 1, 1851, exhibiting the large amount lost to depositors to be $34,207, while it might have been only $8,582, accoring to his own and my present working. This looks enormous in the aggregate, but let us examine how it affected an individual depositor. A large number of deposits were 100 oz. or less. Suppose one of 100 oz. standard, and with value of $1873, including the silver parted. Mr. McCulloh would have left in the refined gold, $1.29 of silver, as I do now; but we did leave in it at that period $5.16 more, being $\frac{3}{10}$ of one per cent, on the value of the deposite. But on the other hand, had we persisted in the close refining, which Mr. McCulloh insists upon as our duty, we should have been compelled to delay the payments of our depositors for a time, which would have cost the bullion holder, in loss of interest, a sum far exceeding the silver left as alloy, perhaps twice the amount. It was therefore manifestly for the public interest that we pursued the course, which was adopted. The remarks I have made upon the 5 per cent silver left in the gold, apply with greater force to the 2 per cent left in it.

But why was I unable to continue refining to the closeness, which is generally desirable, and which has of late years been customary, except in the interval referred to? The explanation is simple. It was because the deposites accumulated faster

than it was possible to refine them fully in the space allotted to my department. In order to secure that space (which I had to take from the chief coiner) an enlargement of the mint was necessary, and an appropriation by Congress for the purpose. The appropriation being secured, the alterations were immediately commenced and pressed through day and night, but they were accompanied by vexatious delays on the part of masons and carpenters, for which no officer of the Mint was responsible. Indeed such delays seemed naturally incident to new constructions, as many persons to their disappointment have experienced. It was not until the beginning of 1851, that the capacity of the refining department became fully equal to the current demands upon it. The Director of the mint in his annual report, dated January 27, 1851, (See Ex. Doc. No. 50, H. R. 31st Congr. 2nd September,) satisfactorily explained the nature of the delay.

The following table of monthly deposits of gold to be refined, from the time of my commencing refining operations, will show, clearly why the Treasury department and the director adopted the temporary expedient of leaving more silver in the gold.

VALUE OF MONTHLY DEPOSITS OF GOLD TO BE REFINED.

1849.			
November,	747,000		
December,	1,669,000		
1850.		1851.	
January,	1,005,000	January,	5,017,000
February,	1,979,000	February,	2,904,000
March,	1,396,000	March,	2,849,000
April,	1,603,000	April,	2,818,000
May,	2,349,000	May,	3,224,000
June,	2,003,000	June,	3,594,000
July,	2,576,000	July,	3,088,000
August,	3,275,000	August,	4,054,000
September,	3,285,000	September,	3,987,000
October,	3,443,000	October,	4,687,000
November,	4,436,000	November,	5,449,000
December,	4,579,000	December,	5,577,000

The refining capacity being only $1,000,000 per month,

when I entered upon my duties as melter and refiner, and the deposits of December, 1849, being beyond that amount, I enlarged it in January, 1850, to work $1,500,000, all the officers supposing that it would not exceed that sum. But the deposits of February surpassing our estimate, again an alteration had to be made, in order to refine two millions. Again, the deposits of May being about two and a half millions, the refining capacity was further extended to meet this demand. The same improvements and enlargement took place in September to meet the unexpected increase in August. I thus continued extending the refining capacity of my department as far as it was possible in the space then allotted to me; but, as I have already mentioned, it was too contracted for the purpose, until, by the new addition to the Mint, new apartments were freed for my use. As soon as that took place, (at the close of 1850,) I commenced those improvements and alteration, by means of which the capacity of my department was made so far to exceed the demands upon it, that we were enabled, not only to pay off our arrear of debt to depositors, and to resume prompt payment on all future deposits, but to return to the former rate of alloy, in which state of efficiency we have ever since continued. These improvements were gradually carried forward during a part of 1851, without interfering with the refining operations. The latest improvements were commenced under the present director, in the fall of 1851, and have been extended to the present time, having been only interrupted during the three first months of 1852, while Mr. McCulloh was trying his process under his own supervision. The alterations contemplated, not so much the extension of the capacity of the Mint, which was already large enough, as the general improvement of the process of refining gold, especially in rapidity and economy of work. Their successful issue, in economy of time, labor, materials and wastage, has been sufficiently shown above.

Let us suppose that a manufacturing establishment, capable of doing a certain amount of work, is unexpectedly called upon to do 50 per cent. more, which it dare not refuse. Some delay would not be considered unreasonable while making the requi-

site alterations. Again and again it is required to increase its manufacturing capacity, which it does not hesitate to do. Could any one reasonably object to its making the goods cost $\frac{3}{10}$ of one per cent. more than before, when their non-delivery within a specified time would cost the receiver perhaps one per cent. more? Such was the case with the mint; and instead of casting blame upon the Secretary of the Treasury and the officers of the Mint, their earnest endeavors to favor the public, and their untiring energy to make the Mint surpass in its capacity any establishment in refining gold the world ever saw, should receive congratulation and praise. As the American people can justly boast that their Mint is not surpassed by any similar establishment in the world in the beauty and excellence of its machinery, in the accuracy and integrity of its assays, so have they now just cause to feel a pride in its capacity to perform whatever work is demanded of it; and any one disposed to find fault with it, is not favored with proper national pride.

I may be permitted to make here one remark touching a certain improvement, which Mr. McCulloh claims as a part of his zinc process. In the Fall of 1851, Dr. Eckert, the present Director, suggested our trying to improve the method of granulating the metal by raising the crucible out of the fire. I happened to be trying the experiment when Mr. McCulloh was present in Feb. 1852, by pouring the melted metal through a cullendered crucible. He complained of this to the Director as an infringement of his patent, and although we were fully aware that he could not claim this, which is a most ancient method of granulating, yet the Director forbore pressing the experiments in order to allow Mr. McCulloh to try his own process fully and leave him no ground of complaint. Raising the crucible from the fire is practised in the British Mint, and pouring melted metal through a cullender has been long known and practised, and neither can be claimed by the recent process of Mr. McCulloh.

10. Another point which Mr. McCulloh charges as evidence of my unskilfulness is, my returning more gold in one or more experiments than I had received. Mr. McCulloh himself, in one of his experiments, returned 0.25 oz. more than he ought, and however he may attempt to explain the result, still the naked fact is there. (See p. 54 of his Report.) Further, he

knows full well that a small increase often occurs and is only apparent. An experiment made by me with gold assayed as usual for depositors, where fractions less than $\frac{1}{2}$ a thousandth are not reported, is quoted by Mr. McCulloh, (Report, p. 13,) to show that the experiments with the usual process cannot be relied on any more than with his; and he asserts that the cause of apparent increase could not be explained, unless the assayer's report had omitted more than the $\frac{1}{2}$ thousandth.

It is evident that Mr. McCulloh has hazarded this statement without making the calculation; for if $\frac{4}{10}$ths of a thousandth were unreported, this would have constituted an addition to the amount chargeable of 2.070 oz.; if it were only $\frac{3}{10}$ths, the addition would have been 1.552, which amounts were more than sufficient, "not only to annul the apparent gain, but to compensate for such actual wastage as must have occurred." In the first case the wastage would have been $\frac{21}{100}$ths of a thousandth, in the second $\frac{9}{100}$ths. It may be added that in this experiment no assay was made for gold in the silver employed for granulation, a precaution which subsequent experience has shown to be indispensable. There were eleven or twelve thousand ounces of silver used for that purpose, and a mere trace of gold would have sensibly affected the result. On reviewing the circumstances of this experiment, I see no proof of carelessness, but a demonstration of the importance of an assay to minute fractions, where accurate results are desired.

11. The last point I shall notice, adduced by Mr. McCulloh as evidence of my unskilfulness, is my leaving 17 oz. of gold in the trial furnace, whereby the loss I experienced in trying his process was explained. It is true that he lays the blame upon the officers of the Mint generally, but as I performed the experiments, I wish to take the whole blame, if there be any, upon myself. Many experiments were tried in that furnace, the sole object of which was to toughen the gold derived from his zinc process, by some of the very plans which he suggested to me, and no special pains were taken to remove the last particles of gold of each previous experiment.

When the Director urged me then to experiment upon wastage by this process, I directed the hearth to be thoroughly cleaned; but as the experiment showed an increase in gold, possibly remaining from the trials for toughening, I directed a

new hearth to be laid, without taking out the old one, because Mr. McCulloh urged me to experiment rapidly. These experiments showed unusual wastage, and if gold had been volatilized in the earlier experiments, it could not have affected the results of the trials made after the new floor was laid, and these were undoubtedly accurate. But in order to determine the question of wastage still more conclusively, the next lot of gold refined with zinc, &c. *was not put in that furnace at all, but was melted in crucibles*, and it was this experiment, carefully conducted throughout, and unattended by accident, but exhibiting more than usual wastage, that chiefly determined the Director to report against that process. Mr. McCulloh was informed of these facts at the Mint in March, 1852, and yet in August, 1852, he asserts that the 17 oz. of gold, found in that furnace, prove that the experiments were incorrect, and that the gold "had not escaped up the chimney, in conformity with their (the officers,) hypothesis of wasteful volatilization." He was told that the principal experiment relied on for wastage had not been conducted in that furnace, and yet he asserts that the 17 oz. of gold found in that furnace explained the wastage by which his process was condemned. This certainly does not look like the candid expression of one seeking the truth and desirous of expressing it.

That accidents should occur in the manifold handling of melted metal and its subsequent treatment by acid, was so well known to Mr. McCulloh, that he only touches upon the subject lightly, by attempting to throw discredit upon all my experiments, because in one, I instituted to determine wastage, more gold was obtained than had been subjected to experiment. I have stated the cause of this, that gold may have remained from our previous experiments on toughening, in spite of our care; or that more gold was experimented on than we estimated, because it had not been assayed to fractions of a thousandth.

Were Mr. McCulloh's experiments free from accident? He performed three experiments on his process, as he rightly states, acknowledges accidents to have occurred in two of the three, and uses these as arguments to show why those two out of three results should not be depended on. Is it not singular that he should find fault with another for obtaining unreliable results in a few cases out of many, when he acknowledges that

his own results were defective and unreliable in two out of three experiments?

And what was the nature of the first accident he met with? He has stated it himself in his Report, p. 4. That he melted gold in one crucible and zinc in another, and when both were in fusion, that he poured the melted gold into the melted zinc; that as the alloy appeared to be chilling, he permitted the workman who held the crucible of melted gold to pour it more rapidly into the zinc. I must make a simple correction here —he not only permitted, but directed the workman to do so. Now gold melts at 2200° Fahr. and zinc at 700°, and we might suppose, a priori, as some of us who were present did suppose, that a consequence of thus rapidly pouring a metal at 2200° into one at 700° might be the generation of vapor of zinc with explosive violence. A series of explosions did take place, which Mr. McCulloh explains as the "too rapid increase of temperature, uniting with the effect of exposure to the air, causing combustion of the zinc to take place, and with such intensity at first, that some of the hot metal was projected from the crucible, and scattered in drops or grains upon the floor and various surrounding objects." (Report, p. 4.) A chemist would have been very apprehensive of explosion, to say the least, in pouring melted gold rapidly into melted zinc. A chemist knows full well that the simple act of combustion of zinc in a crucible would not project the metal from the crucible. He further says —"One of these grains coming in contact with the adjacent woodwork of the Mint, rendered very combustible by saturation with nitre from the refining operations, it took fire," &c. (Report, p. 4.) The force of the explosion may be estimated from the fact, that the "adjacent woodwork" was the ceiling, at a height of 15 feet from the floor where the experiment was made. It is rather surprising that the drops were not projected on some of the adjacent numerous lookers on. The projected metal had so penetrated the ceiling that, although the latter was quickly deluged with water, it again exhibited fire several hours after, and in order to extinguish it, holes were bored in the floor above and water freely applied.

Mr. McCulloh has stated, (Report, p. 4,) that the wastage in this experiment was only $1\frac{1}{2}$ thousandths, which any one who witnessed it knows impossible. Some of the drops, be-

side reaching the "adjacent" ceiling, were projected into a pan containing ashes from one of my furnaces. Upon sifting out these grains, I pointed out to him some grains of silvery gold in addition to his zincous gold, and he acknowledged them to be so, but as the quantity was small, I allowed the whole to pass as his own. These grains are sufficient to account for the smallness of wastage, when the experiment was accompanied by an explosive projection of particles of metal.

IV. Mr. McCulloh has made, in his pamphlet and letters, repeated allusions of a condemnatory character to other officers connected with the Mint. These gentlemen are fully able to sustain themselves against such aspersions, but as they have been cast at them over me, I regret that I should be the unintentional cause of their suffering, and feel much more indignant than at the attempts to cast a shade upon my own reputation.

He first presumes to attack Dr. R. M. Patterson, who, for sixteen years, had faithfully presided over the institution, and fully contributed his share towards maintaining the exalted station which the Mint of the United States has held, in comparison with those of the rest of the world.

Mr. McCulloh states, in his letter to yourself, sir, of February 5, 1851, (Memorial append. p, 67,) that he has good reason to believe the Director of the Mint to be influenced by hostility to him. He has asserted, (Memorial, p. 10,) that I stated to him "that the officers of the Mint were hostile to him, though the Director might probably be less so than others;" and again, in a letter to the present Director, September 29, 1851, (Letter, p. 19,) he makes it appear that I had stated Dr. Patterson to be hostile to him. Such a charge against Dr. Patterson is based on his recollection of a conversation held with me in September, 1850, and stated six months afterwards. I now declare his recollection to be erroneous, for instead of my asserting that hostility of Dr. Patterson, I reminded Mr. McCulloh of what he had stated to me previous to my application for the office of Melter and Refiner, when he spent many hours with me on several successive days, urging me not to accept the position, because intercourse with the officers was so disagreeable, and that the hostility they exhibited towards him

would be shown towards me. So cogent were his arguments against my applying for the office, that although I was well acquainted with the officers personally, I declined being a candidate for the office. Mr. McCulloh then took active measures to get the late Mr. J. B. Reynolds appointed, but upon my hearing the more correct representations of the officers of the Mint I did apply for the office, and being personally well known to the Hon. Wm. M. Meredith, the Secretary of the Treasury, as possessed of the requisite knowledge, skill and integrity, I received the appointment forthwith. Mr. McCulloh was disappointed at my acceptance of the office, although he made the best of it by favoring my appointment, and I could not for a long time divine the secret springs of his movements. These have since appeared. Mr. Reynolds was acquainted with the zinc process, and had made some experiments in relation to it in my laboratory, in 1849, and if appointed as melter and refiner, he was to have improved that process, and would have been called upon to report upon it, and as Mr. McCulloh supposed, favorably. Being foiled in his plan for the appointment of Mr. Reynolds, he then urged the necessity of my having an assistant, knowing that I would take Mr. Reynolds as such. I would have done so gladly, but as the other officers assured me that the business did not really require it, and that the office would be a mere sinecure with an assistant, I could not conscientiously ask for one. Excuse my here offering, in passing, a tribute to the memory of the late Mr. Reynolds, a rising young man of high integrity and ability, already distinguished in the Franklin Institute and the University of Pennsylvania, very generally known and universally esteemed, and had his life been spared, destined to occupy a prominent position in his country's history. He had as high an opinion of the process of Mr. McCulloh as I had ; but I can assert from my knowledge of him, that as melter and refiner, he would not have suffered his conscience to upbraid him for declaring in favor of it, unless it had really proved in all respects superior to the one in use.

I am compelled by subsequent events to point to this my conscientious course of action as the first period when Mr. McCulloh began to entertain a feeling of distrust towards me. He has alluded to the above facts slightly in his letter to the Se-

cretary of the Treasury, (p. 7,) where he speaks of my first declining, and again appearing as a candidate for the office, as "inconsistent conduct," which he says was only explicable from my having informed him, that Dr. Patterson "promised me, that I should not be required to devote my time to the duties (of the office) to such an extent as to impair my private business." The apparent inconsistency was caused by his misrepresenting the officers. Did such a charge only affect myself, I would simply say that his recollection was inaccurate, but since it affects one for whom I have ever entertained a warm esteem, I declare Mr. McCulloh's assertion to be an untrue representation. When Dr. Patterson called upon me and wished me to present myself as a candidate for the office, as he thought I had a better knowledge of chemistry than Mr. Reynolds, who had devoted himself chiefly to physics, I told him that if the duties of the office would debar me from further experiment in general chemistry, I did not desire it. In reply, he stated that although the duties were then more onerous than they had been, yet he believed I would find ample time for general experiment in my laboratory, as he was aware a chemist, desirous of improvement, should do, and that my advancing skill, as well as the laboratory itself, could be made subservient to my duties as melter and refiner at the Mint. This is the substance of our conversation. Mr. McCulloh's recollection is of what I informed him; mine of what actually took place. If I told Mr. McCulloh what he has represented in his letter, (p. 7,) I clearly told him an untruth. But I must deny his assertion altogether. I further told Dr. Patterson that I would procure an assistant to take charge of the business part of the laboratory, and so hasty was I in this respect, that I am afraid I incurred the displeasure of Professor A. D. Bache, by too urgently calling for one of his assistants, who had long been desirous of studying chemistry more fully.

It thus appears that the two charges against Dr. Patterson prove wholly groundless, being based either upon an inaccurate recollection of conversations, or upon wilful misrepresentation. In either view, the character of Dr. Patterson will shine the brighter through the shadow attempted to be cast upon it. To the charge of disregarding the instructions of the Secretary of the Treasury, Dr. Patterson has himself made full and satisfactory answer.

2. Mr. McCulloh has charged that I devolve my duties at the Mint "chiefly upon workmen, though in part upon a young substitute, who does not possess the scientific and metallurgic attainments, which are requisite in the person holding the office of melter and refiner." (Letter, p. 7). As far as regards my system, I only say that I devolve upon my foremen and workmen such work as I think they can perform, precisely as my predecessor did, in whose path I follow, except perhaps that I have less suspicion of the integrity of others. Whether correct or not, this principle of trusting others I hold to be a true Christian injunction, and believe that want of integrity is most frequently generated and fostered by suspicion.

In regard to my men, they are well qualified and ever ready to do all the work enjoined upon them; and as my special instructions for experiment and alteration in work and apparatus are issued only to my foremen, or are supervised by myself personally, I do not know how Mr. McCulloh can find fault with that, because he praises these very men, and calls upon them to express public opinions on his process, (letters 4 & 6 in his Report.) While he confided a great deal to them, he blames me for doing so. But such is my knowledge of them and my confidence in them, that I shall continue to bestow the same regard upon them which I have ever done. Mr. McCulloh's public opinion of the men is apparently different from his private one, for in a letter to me of August 14, 1850, he says he does not wish any modus operandi of his tried at the Mint, except under his own or my guidance, because "in new matters trifling difficulties are magnified into insuperable obstacles by ignorant and unskilful men." Again, while experimenting in the Mint, in February, 1852, he informed the men that his process required the same amount of labor as the present, while in his Memorial and Letter, he asserts that it was much more economical in labor. Again, the strict watch he placed over his experiments by persons not belonging to the Mint, does not indicate very strong confidence in our workmen or foremen. I leave Mr. McCulloh to reconcile these contradictions.

The attack upon my "substitute" was wholly uncalled for and most unjustifiable, and I feel indignant at it. Why could Mr. McCulloh not be content with endeavoring to heap odium

upon me, instead of uttering what I can ascribe to no other source than maliciousness, since it affects those who had done him not the slightest real or fancied injury.

The gentleman who aids me in the discharge of my duties, Mr. John H. Taylor, is in every way well qualified for the duties which he performs, and for much higher. He has been most attentive and faithful to his duties, ever since he was appointed in the spring of 1850, and my only regret in relation to him is, that he is not in such a post as his ability, industry and integrity warrant.

I cannot pass over the subject without offering well merited praise to my aid, foremen and men generally, that my intercourse with them has been of the most pleasant character, and that they are characterized by an unusual degree of fidelity, integrity and zeal for the interests of the institution and the government.

What other assistants and officers in the institution have suffered of reproach or contumely on my account, I regret extremely, and equally do I regret that Mr. McCulloh should have thought it necessary to make his devastation so wide-spread, for I am afraid it may recoil upon him. Every individual of the officers and assistants, and others, who have been obliged to touch any part of the operations relating to his process, has been obliged to undergo a severe rebuke; and yet I am sure that each one has faithfully performed his duty to the best of his ability, without the slightest reference to the $25,000 appropriated by Congress. That he should wish to attack some one is a natural consequence of disappointment. That I should be singled out as the main object of his thunderbolts, while others only feel the lateral shock, is the natural consequence of my having been interested with him and appointed to try his process, and yet having the independence to declare that neither it nor mine was equal in value to that which is now followed. I trust, sir, that the consciousness of having acted with integrity in all my relations to him and his process will ever enable me to hold his maledictions lightly—very light, indeed, in comparison with my regard for truth and perfect integrity of purpose.

In presenting the preceding, perhaps too lengthened, exposition of the facts involved in the charges of Mr. McCulloh,

you will please to observe, sir, that I have abstained from every species of personality, which is offensive to refined taste —that I have presented rebutting evidence of his charges, drawn either from his own writings or publications, from documents in the Mint, or, in a very few instances, from recollection, as his own were—that I have presented facts capable of proof and not inferences of motives, which are too liable to error—that I have frequently abstained from any remarks or arguments upon the facts presented, preferring the simple enunciation of truth, and that I have acted wholly on the defensive, although I might have wielded weapons of offence. I did not choose to avail myself of what is generally regarded as the vantage ground gained by carrying the war into Africa, because I have no predilection for such warfare, my sole object and aim being to present the simple truth in all its clearness.

I think it has been clearly shown that Mr. McCulloh in his charges, direct or indirect, has violated all the postulates with which I commenced the investigation. He has sometimes given more than the exact truth, and again has presented less than the full truth. I think the evidence clearly shows that he has in some cases made a misrepresentation of facts, but whether designedly or not, I cannot certainly say; although I would fain believe not with intent to misrepresent. If not so, then the misstatements are either due to incorrect information from others, or from suspicion. If derived from others, what value does he set upon reputation, who is willing to blast it by the breath of other people? If from suspicion, I feel a sincere sorrow for the pain that bosom feels that suffers suspicion to gnaw upon it.

And now, it may be asked, what feelings sway my breast in relation to Mr. McCulloh. I trust, sir, that while I am ready to defend my character from aspersions cast upon it, from a thorough conviction of their untruth, I am equally ready to pardon their author, because I know well the general tendency of our common nature to err, and would wish the same leniency extended towards myself. I have forborne speaking on the subject of his charges against me for more than a year, having hoped that time would dispel the misty perceptions of his mind, and develope my integrity in all that related to him. But since I have learned that he was industriously employed

in giving the greatest publicity to his charges, by presenting copies of his publications to every member of Congress, to the members of the departments at Washington, to numerous persons in Philadelphia and New York, and elsewhere, (how far I know not;) and that he has caused extracts from these publications to be inserted in several journals, at different times, presenting views and statements designed to injure my character; and since my friends have only rebutted the insinuations thrown out, from their personal knowledge and confidence in me, without their being able to reply in consequence of their not knowing all the facts,—because a portion of the press has drawn false deductions from his statements, relating as they do to technical operations, which are not generally understood, and has impeached the accuracy of the Mint accounts, and the integrity of its issues;—I have therefore made the present reply to Mr. McCulloh's writings and publications generally, in relation to the subject, and I believe, in accordance with my intentions at the outset, in a deliberate and temperate manner. I still entertain kind feelings towards him, which no actions or writings of his can shake; and in closing my remarks, I express a sincere and earnest wish that he may one day perceive he has done me injustice, and be willing, as I shall ever be, to cast the mantle of oblivion over all that has passed.

I have the honor to be, dear sir,

Your obedient servant,

JAMES C. BOOTH.

HON. MILLARD FILMORE,

PRESIDENT OF THE U. S.